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A NEW SPECIES OF ERICACEAE-FEEDING *DECODES* FROM THE CHANNEL ISLANDS AND MAINLAND OF SOUTHERN CALIFORNIA (LEPIDOPTERA: TORTRICIDAE: CNEPHASIINI)

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Abstract.—Decodes helix, NEW SPECIES, is described from Santa Rosa and Santa Cruz islands, Santa Barbara County, and several sites on the mainland in San Diego County, California, and Baja California, Mexico. It appears most closely related to *D. aneuretus* Powell on the basis of male and female genitalia, host plant, and seasonal flight period. *Decodes helix* is distinguished by the long, laterally bent aedeagus and very long, slender, coiled ductus bursae. Larvae were collected from *Arctostaphylos confertifolia* (Ericaceae) on Santa Rosa Island and *A. insularis* on Santa Cruz Island.

Key Words.—Insecta, biogeography, larval food plant, *Arctostaphylos, Xylococcus.*

Decodes Obraztsov, 1961, is one of four genera of Cnephasiini that occur in North America. *Decodes* and the closely related *Decodina* Powell, 1980, are confined to the Western Hemisphere, while *Cnephasia* Curtis and *Eana* Billberg are Holarctic in distribution. Powell (1980) treated 19 species of *Decodes,* which range from southern Canada to southern Mexico; in addition, there are several undescribed species represented in collections. Some of these are known from only one sex or are otherwise poorly documented; one has become known better through recent collections and is the subject of this paper.

While conducting independent inventories of Lepidoptera on the California Channel Islands in collaboration with the National Park Service and at Naval Air Station (NAS) Miramar, under contract to the U.S. Navy, we encountered a winter-flying species of *Decodes* that proved to be undescribed and helped resolve a 30-year old mystery shrouding this species.

History.—In 1966 Powell collected larvae of *Decodes* from *Arctostaphylos insularis* E. Greene (Ericaceae) on Santa Cruz Island that matured, pupated, and metamorphosed but failed to emerge. The male genitalia differed slightly from *Decodes aneuretus* Powell (Obraztsov & Powell 1961, Powell 1964), which was described from Monterey County, suggesting this was a related new species, but owing to the absence of fully developed adult specimens, a description was not prepared. In 1973, *D. aneuretus* was reared from *Arctostaphylos virgata* Eastwood in Marin County (Powell 1980), and in recent years from *A. hooveri* P. Wells at Big Creek, Monterey County, California (Powell, unpublished data), providing supporting evidence of the close relationship to the island species. In April 1995, *Arctostaphylos*-feeding larvae of *Decodes* were collected on Santa Rosa Island, which produced adults in late December 1995 and January 1996. The adults proved to be morphologically distinct from *D. aneuretus,* and conspecific not only

with the *Decodes* of Santa Cruz Island but with specimens collected at NAS Miramar on the mainland of southern California in winter 1995/1996.

Additional specimens of the new species were discovered in the personal collection of Ronald Leuschner, from two sites several miles inland from NAS Miramar. The species apparently has escaped notice because adults fly during winter and early spring, November to March.

Materials and Methods

Decodes specimens were examined from most major institutional collections in North America (cited by Powell 1980); those of the new species were located in the Essig Museum of Entomology, University of California, Berkeley (UCB); San Diego Natural History Museum, San Diego (SDNHM); and Leuschner Collection, Manhattan Beach, California (RLC).

Larval collections were made by clipping new terminals from the host plant; these were placed in polyethylene bags lined with paper toweling, which larvae used to construct cocoons under the plant material. Bags were placed in outdoor cages at Berkeley for overwintering.

Dissection methodology followed that summarized in Brown and Powell (1991). Terminology for wing venation and structures of the genitalia follows Horak (1984). Abbreviations: FW = forewing; n = number of specimens measured or dissected; r.f. = reared from; M = male; F = female.

Decodes helix Powell and Brown, NEW SPECIES
(Figs. 1–6)

Types.—Holotype male: CALIFORNIA. *SANTA BARBARA Co.:* Santa Rosa Island, Torrey Pines area, 28 Apr 1995 (larva), reared from *Arctostaphylos confertifolia,* emerged 6 Jan 1996 (J. Powell, 95D93) [JAP genit. prep. 7262]; allotype female, same data; both deposited in Essig Museum of Entomology, University of California, Berkeley. Other paratypes (n = 37): CALIFORNIA: *SAN DIEGO Co.:* Dos Picos County Park, 5 mi. [8 km] W [of] Ramona, 1 M, 5 Feb 1987 (R. Leuschner, RLC); Naval Air Station Miramar, 1 F, 1 Jan 1996, 1 M, 15 Jan 1996, 2 M, 7 Feb 1996, 1 F, 16 Feb 1996, 1 F, 23 Feb 1996, 1 M, 7 Mar 1996, 1 F, 8 Mar 1996, 1 F, 21 Mar 1996, 5 M, 1 F, 19 Nov 1996, 2 M, 28 Nov 1996, 1 M, 3 Dec 1996, 1 F, 8 Dec 1996, 2 M, 2 F, 13 Dec 1996, 1 M, 29 Dec 1996, 2 F, 1 Jan 1997, 1 M, 3 Feb 1997 (N. Bloomfield, SDNHM, UCB, USNM) [genit. preps. JWB 726M, 727F, 780M, 781F, 788M, 789F, 868M, 869F, JAP 7351F]; Silverwood Sanctuary, Wildcat Canyon, 5 M, 6 Feb 1987 (R. Leuschner, RLC) [JWB genit. prep. 797]. *SANTA BARBARA Co.:* S Ridge Rd., Santa Cruz Island, 1 M (+ 3 pupae), 29 Apr 1966 (larvae), r.f. *Arctostaphylos insularis* (J. Powell & A. Slater, JAP 66D39, UCB) [JAP genit. prep. 5769]; same data as holotype, 1 F, emerged 30 Dec 1995; Cherry Cyn., 750–800′ [220–260 m], Santa Rosa Island, 1 M, 26 Apr 1995 (larva), r.f. *A. confertifolia,* emerged 20 Jan 1996 (J. Powell, 95D62, UCB). MEXICO. *BAJA CALIFORNIA NORTE:* 1 mi. E [of] Santo Domingo Mission, 1 F, 18 Mar 1972, at light (J. Powell & J. Doyen, UCB) [JAP genit. prep. 3528].

Description.—Male: FW length 8.5–9.5 mm ($\bar{x}$ = 9.3; n = 12); length 3.2–3.4 × width. Head: Frons smooth-scaled below eye, scales gray, white-tipped; vertex rough-scaled, scales banded whitish and gray. Ocelli present. Antenna pale brown, banded with whitish and gray scales. Labial palpus

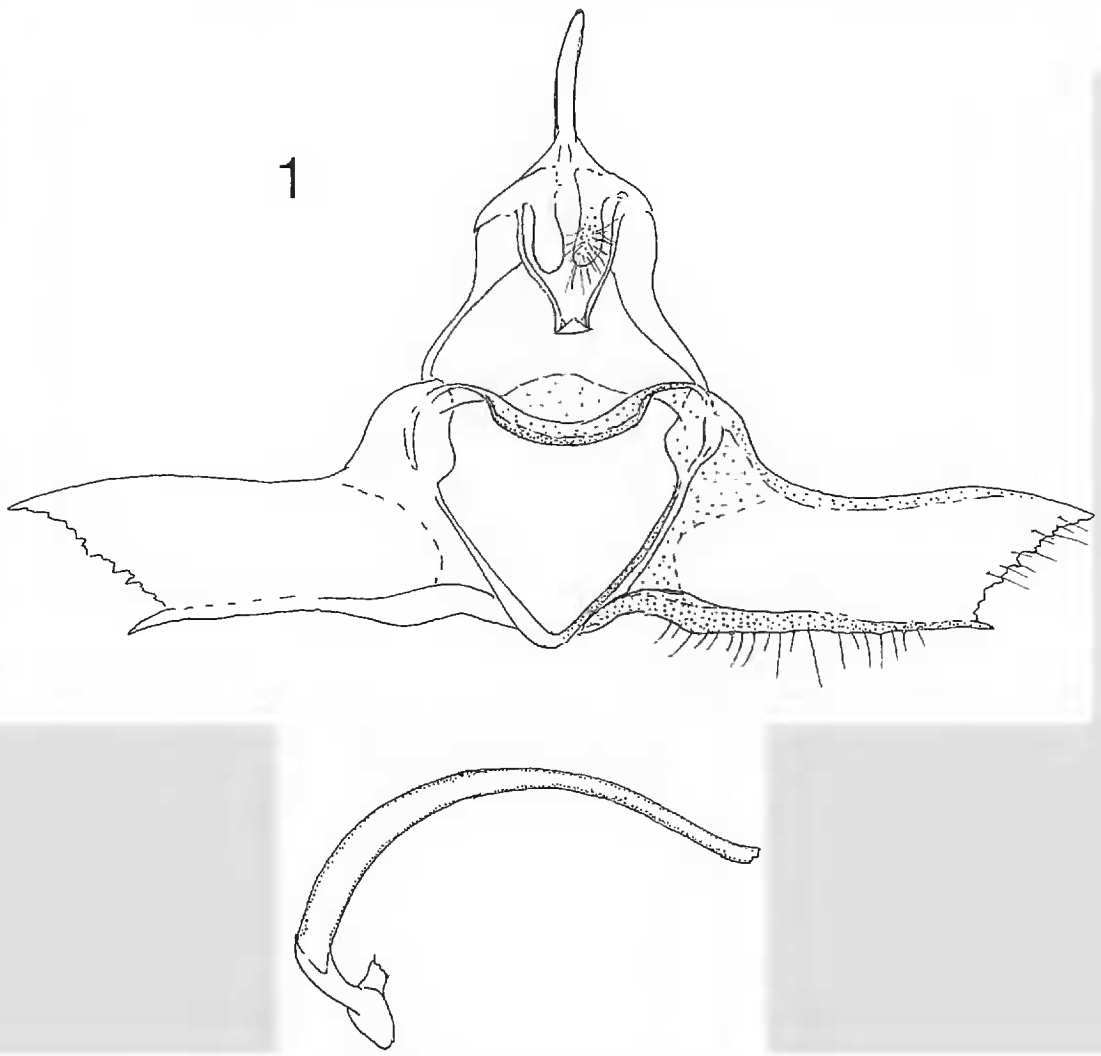


Figure 1. Male genitalia of *Decodes helix,* ventral aspect, valvae spread, aedeagus removed and shown in lateral aspect.

moderately elongate, segment II ca. 0.9 × eye diameter, III ca. 0.6 × eye diameter. Thorax: Dorsal scaling concolorous with head; venter pale shining gray. Forewing: Gray with pale dusting; specimens uniform mouse gray with a fine, black line along the Cu crease (Fig. 3), or with black scaling forming one of several polymorphic forms: a) faint lines along veins; b) poorly defined, outwardly oblique, transverse lines in costal area, extending to define a submedian whitish band, narrow at costa broadened towards dorsal margin, and short longitudinal lines in termen (holotype, Fig. 4); c) black dorsal margin (Fig. 5); d) black smudge along Cu fold in cell (Fig. 6). Fringe pale gray. Hindwing: Shining whitish gray; fringe whitish. Genitalia: As in Fig. 1 (drawn from JWB slides 780, 788, NAS Miramar; $n = 7$). Uncus, socius, and gnathos unmodified. Transtilla a complete band, only slightly dilated, rounded mesally. Valva elongate, attenuate apically. Sacculus well defined, extending slightly beyond valva as a short, free, narrow process. Aedeagus extremely elongate, strongly arched, slightly twisted distally.

Female.—FW length 8.5–10.0 mm ($\bar{x} = 9.1$; $n = 7$); length 3.15–3.30 × width. The smaller sample of females ($n = 11$) does not show all the FW pattern variation of males. Genitalia: As in Fig. 2 (drawn from JWB slide 727, NAS Miramar; $n = 6$). Sterigma a sclerotized band extending laterally, becoming an elongate funnel-shaped antrum. Posterior portion of IX sclerotization rectangular. Ductus bursae more elongate than any other known *Decodes,* coiled and sclerotized along margin. Corpus bursae round; signum long; base of ductus seminalis near junction of ductus bursae and corpus bursae.

Diagnosis.—Decodes helix is most similar to *D. aneuretus* in host plant (feeding on Ericaceae), life cycle (spring feeding, winter-flying), and structures of the genitalia. It is distinguished from all other *Decodes* by characters of the male and female genitalia. The most diagnostic character of the male genitalia is the long, slender, strongly curved aedeagus which is similar to that of *D. aneuretus,* but is comparatively longer and more arched. The length of the aedeagus from phallobase to tip is approximately 1.25 times the length of the costa of the valva in *D.*

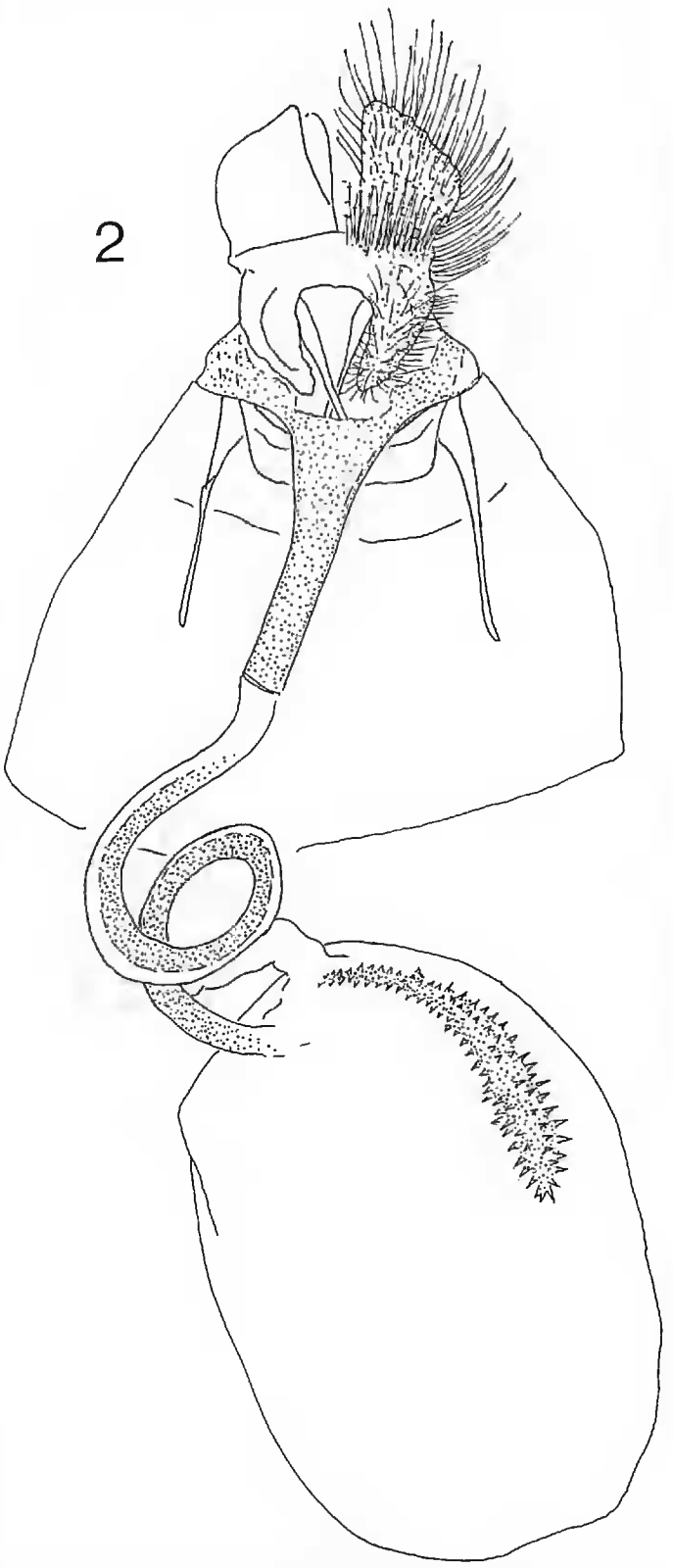
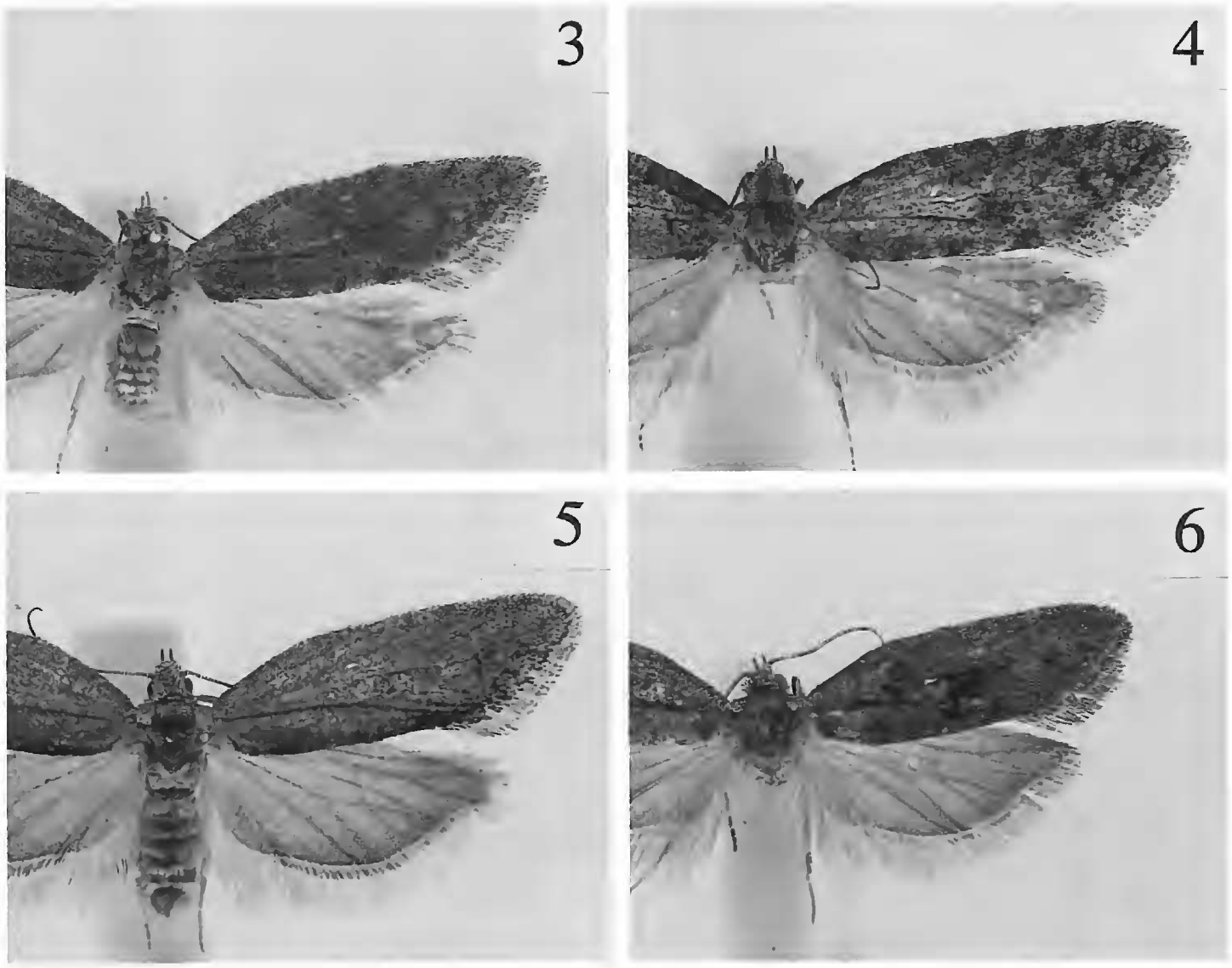


Figure 2. Female genitalia of *Decodes helix,* ventral aspect.

aneuretus and greater than 1.5 times the length of the costa in *D. helix.* The most diagnostic character of the female genitalia is the long, coiled, sclerotized ductus bursae; no other species in the genus has a coiled ductus bursae. In general facies it is a nondescript, variable species, and no consistent, single feature reliably separates it from some of its congeners. Many of the specimens taken by black-light trap are too worn to assign to one of the characterized morphs; hence, no attempt is made to quantify their proportional occurrences.

Distribution and Biology.—The new species is known from the northern California Channel Islands, Santa Barbara County, coastal San Diego County, California, and the northwestern portion of the peninsula of Baja California, Mexico. Specimens have been collected inland to approximately 30 km (19 mi) from the coast at Silverwood Audubon Sanctuary in San Diego County.



Figures 3–6. Adult specimens of *Decodes helix* from Santa Rosa Island, California: Figure 3. paratype male, Cherry Cyn. (JAP 95D62); Figure 4. holotype male (JAP 95D93, slide JAP 7262); Figure 5. allotype female, same data as holotype; Figure 6. paratype female, same data as holotype (slide JAP 7259).

NAS Miramar, which is located in south-central San Diego County, supports a heterogeneous mosaic of primarily drought-tolerant communities typical of coastal southern California, including chaparral, coastal sage scrub, grassland, and riparian scrub. Of eleven blacklight sampling sites established on NAS Miramar, which encompasses ca. 75 km^2, specimens of the new *Decodes* were collected at six.

The flight period of *D. helix* ranges from November to late March, varying from year to year. For example, in winter 1995/1996 adults were captured from mid-January to late March; in winter 1996/1997 adults were captured from late November to early February.

On Santa Rosa and Santa Cruz islands, larvae feed in the new foliage terminals of *Arctostaphylos* (Ericaceae) in April. Their shelters were not distinguished from those of *Pseudochelaria scabrella* (Busck) (Gelechiidae) and three species of *Epinotia* (Tortricidae: Eucosmini) at the same localities. Larvae leave the foliage to form tough silken cocoons in leaf litter, or in the soil, as is known for *D. fragarianus* (Busck) (Powell 1964). The only coastal manzanita in San Diego County, *Arctostaphylos glandulosa* Eastwood, is exceedingly rare at NAS Miramar. However, another ericaceous shrub, *Xylococcus bicolor* Nuttall, is widely distributed and may serve as the host plant for the *Decodes* there.

On NAS Miramar, *Decodes helix* is sympatric but almost entirely allochronic with two congeners, *D. fragarianus* and *D. asapheus* Powell.

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